

**STATE OF VERMONT
PUBLIC SERVICE BOARD**

Docket No. 6860

Petitions of Vermont Electric Power Company, Inc. ("VELCO") and Green Mountain Power Corporation ("GMP") for a Certificate of Public Good authorizing VELCO to construct the so-called Northwest Vermont Reliability Project, said project to include: (1) upgrades at 12 existing VELCO and GMP substations located in Charlotte, Essex, Hartford, New Haven, North Ferrisburgh, Poultney, Shelburne, South Burlington, Vergennes, West Rutland, Williamstown, and Williston, Vermont; (2) the construction of a new 345 kV transmission line from West Rutland to New Haven; (3) the construction of a 115 kV transmission line to replace a 34.5 kV and 46 kV transmission line from New Haven to South Burlington; and (4) the reconductoring of a 115 kV transmission line from Williamstown, to Barre, Vermont

**SUPPLEMENTAL TESTIMONY OF
THOMAS DUNN**

**ON BEHALF OF
VERMONT ELECTRIC POWER COMPANY, INC.**

Mr. Dunn is the VELCO Project Manager for the Northwest Vermont Reliability Project. His testimony (1) introduces the other witnesses providing supplemental testimony on behalf of VELCO in these proceedings, (2) provides an overview of the proposed changes to the original Northwest Vermont Reliability Project ("NRP" or "Project") application affecting several substations and line routes, (3) sets forth the expected costs and benefits of the proposed changes and, (4) provides preliminary cost and engineering information on underground transmission.

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**SUPPLEMENTAL TESTIMONY OF
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**ON BEHALF OF
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I Introduction

1 Q1. Please state your name, business address and qualifications.

2 A1. My name is Thomas Dunn. My business address is Vermont Electric Power Company,
3 Inc. ("VELCO"), 366 Pinnacle Ridge Road, Rutland, Vermont 05701. I am employed by
4 VELCO as Manager of New England Power Pool ("NEPOOL") relations.
5

6 Q2. Have you previously filed testimony in this docket?

7 A2. Yes.
8

9 Q3. What is your role in the Northwest Vermont Reliability Project?

10 A3. I am the Project Manager for the VELCO Northwest Vermont Reliability Project ("NRP"
11 or "Project"), which is the subject of this proceeding.
12

13 Q4. What is the purpose of your supplemental testimony?

1 A4. My testimony provides an overview of the improvements (“Project Improvements”
2 “Improvements”) VELCO is proposing to make to the original NRP configuration,
3 explains why the improvements are being proposed, provides the estimated cost of the
4 proposed improvements, and, as requested by several intervenors, provides cost and
5 preliminary engineering information on underground transmission.
6

7 Q5. Please provide a list of the witnesses who will be providing testimony in the supplemental
8 filing.

9 A5. In support of this petition, VELCO submits the supplemental testimony and exhibits
10 sponsored by the following witnesses:

<u>Witness</u>	<u>Subject</u>
11 Thomas Dunn 12 (VELCO NRP Project 13 Manager) 14	Provides an overview of proposed changes to the Project, introduces other VELCO witnesses, summarizes the 15 estimated cost of the proposed changes to the Project costs.
16 David J. Boers, P.E. 17 (Burns & McDonnell 18 Engineering Company) 19	Provides Project design detail of the proposed line reroutes and the substation modifications.
20 Terrence J. Boyle 21 (T.J. Boyle & Associates) 22	Provides an aesthetics analysis of the proposed line reroutes and the substation modifications.
23 Art Gilman 24 (William D. Countryman, 25 Environmental Assessment 26 Planning) 27	Provides a preliminary description of the proposed changes’ impact upon air and water purity, water resources, the natural environment, wildlife habitat, and primary and agricultural soils.

28 Q6. Please summarize the proposed project improvements?

29 A6. VELCO is proposing changes in the routing of the 115 kV New Haven to Queen City
30 transmission line in New Haven, Vergennes, Ferrisburgh, Charlotte and Shelburne. In
31 addition, VELCO is proposing to construct a new substation in Vergennes, relocate the
32 Charlotte substation, and modify the design of the Shelburne and Queen City substations.

1 Q7. Why is VELCO proposing the changes to the Project?

2 A7. VELCO is committed to working with affected communities to understand their concerns
3 and, where possible, offer changes to the project to address concerns. VELCO has had
4 numerous meetings with representatives of the various communities affected by the
5 Project. We have learned a great deal about the concerns the communities have about the
6 NRP. The Project Improvements we are proposing are in response to the concerns
7 expressed by the communities. For each of the changes described below, I will provide
8 an explanation of why VELCO is proposing the change along with a detailed description
9 of the proposed change.

10
11 **II. Transmission Line Reroutes**

12 **1. Vergennes Reroute**

13 Q8. Please describe the Vergennes Reroute.

14 A8. In the original petition VELCO sought authorization to construct a 115 kV line from the
15 VELCO's New Haven substation to Green Mountain Power's ("GMP") Vergennes
16 substation and to remove the existing 46 kV line owned by GMP and Central Vermont
17 Public Service Corporation. VELCO is proposing, as the preferred route, to locate the
18 115 kV line next to the railroad tracks from New Haven to Ferrisburgh to the northeast
19 corner of Vergennes to a new proposed substation and from there back into Ferrisburgh
20 (see VELCO Exhibit TD-SUPP(1)-1). In addition, the existing 46 kV line from New
21 Haven to Vergennes, which passes through 1.4 miles in Waltham, would be removed¹. In
22 order to provide service to the existing GMP Vergennes substation, VELCO is proposing
23 to construct a new 115/34.5 kV substation in the northeast corner of Vergennes. GMP

¹There are several miles of 12.5 kV distribution underbuild (12.5 kV and 46 kV lines on the same pole) on this line. The 12.5 kV distribution will remain. See the testimony of Terry Cecchini.

1 will construct a short section of 34.5 kV transmission line to connect the existing 34.5 kV
2 line to the new substation.

3
4 Q9. Why is VELCO proposing the Vergennes reroute?

5 A9. In meetings with officials and residents from the City of Vergennes concerns were
6 expressed about the visual and land use impacts of the proposed replacement of the 46 kV
7 line with a 115 kV line and the expansion of the existing GMP Vergennes substation.
8 VELCO was asked to consider alternatives that would eliminate the need to construct
9 new facilities in the downtown Vergennes area. In response to this request, VELCO and
10 GMP developed the alternative described above.

11
12 Q10. Does the City of Vergennes support the proposed reroute?

13 A10. Yes. The Vergennes City Manager, in several conversations with me and other VELCO
14 personnel, indicated that the City supported the reroute proposal and it is possible that
15 VELCO will enter into a stipulation with the City of Vergennes and other parties
16 supporting the proposed alternative.

17
18 Q11. Are there any concerns about the proposed reroute?

19 A11. Yes. With the new configuration Vergennes will be served from a radial 34.5 kV line
20 originating in the new substation in Vergennes. As noted in Mr. Cecchini's testimony,
21 the reroute configuration, while more reliable than the present configuration, is not as
22 reliable as the configuration in the original filing because Vergennes will now be served
23 by a radial line approximately 1.6 miles in length. In the original filing Vergennes was to
24 be served directly from the 115 kV system at the existing Vergennes substation.

25
26 Q12. What steps are you proposing to address the reliability concerns?

1 A12. VELCO is proposing to install a three breaker, 115 kV ring bus at the new substation.

2 This will ensure that line faults occurring north or south of the substation will have only a
3 brief impact on Vergennes. In addition, VELCO will locate a spare 115/34.5 kV
4 transformer at the new substation. This transformer will be wired in a manner that will
5 permit service to be restored within minutes in the event of a failure of the primary
6 transformer. This will reduce the outage time in the unlikely event of a failure of the new
7 115/34.5 transformer. GMP's witness, Terry Cecchini, addresses the steps that GMP will
8 take to ensure that the reliability provided to Vergennes will be adequate.

9
10 Q13. Do you believe that the new configuration will provide adequate reliability?

11 A13. Yes. The proposed reroute configuration will provide adequate reliability because
12 Vergennes will be served from a relatively short 34.5 kV line and the new 115 kV line.
13 With a three breaker ring bus, new relaying, larger wire, new poles and regular
14 maintenance used on the new 115 kV line along with the measures proposed by GMP, I
15 believe that the proposed reroute configuration will provide reliable service.

16
17 Q14. What is the cost of the proposed reroute compared to the cost of the original
18 configuration?

19 A14. In the original configuration, the 115 kV line would be approximately 4.9 miles in length.
20 This line would have several miles of distribution underbuild. At an approximate cost of
21 \$278,000 per mile, the cost to construct this line is estimated to be approximately
22 \$1,362,200. The rerouted line is approximately is approximately 3.6 miles in length. It
23 will have little if any distribution underbuild. Nonetheless, to be conservative, VELCO
24 estimates that the cost per mile for the new line will remain the same. Thus, the
25 estimated cost of the 115 kV line reroute is \$1,000,800. The cost to construct the .5 mile
26 34.5 kV line is estimated to be \$100,000. In summary, the cost of the proposed line
27 reroute is approximately \$261,400 less than the cost of the line in the original proposal.

1 **2. Ferrisburgh Reroute**

2 Q15. Please describe the proposed Ferrisburgh reroute.

3 A15. Referring to VELCO Exhibits TD-5, pp 4-5 , at mile post (“MP”) 8.9 and TD-Supp(1)-1,
4 VELCO is proposing that the new 115 kV line depart from the railroad corridor and head
5 in a northwesterly direction along the edge of a small stream and join the existing GMP
6 corridor near existing pole 392. Heading in a northerly direction, VELCO is proposing
7 to use the existing corridor all the way to where this corridor rejoins the railroad near
8 existing pole 377 (approximately MP 9.75).

9
10 Q16. Why is VELCO proposing this reroute?

11 A16. At meetings with representatives from the Town of Ferrisburgh, including the Town
12 Manager, VELCO was asked if it was possible to move the proposed line to avoid several
13 residences in the Little Chicago Road area. VELCO agreed that the reroute was possible
14 and that it would not affect reliability of the 115 kV line.

15
16 Q17. What is the cost of the proposed reroute compared to the cost of the original
17 configuration?

18 A17. The originally proposed the line was approximately .9 miles in length. The new
19 proposed configuration is approximately 1.0 miles in length and will cost approximately
20 \$28,000 more than the original proposal.

21
22 **3. Charlotte Reroute**

23 Q18. Please describe the Charlotte reroute.

24 A18. VELCO is proposing to relocate the new 115 kV line from the railroad to an open field
25 adjacent to the Waldorf School on Ferry Road. Referring to VELCO Exhibit TD-
26 Supp(1)-2, VELCO is proposing that the new 115 kV line leave the railroad corridor just
27 south of existing GMP pole 267 (MP 16.5) and head northwesterly for less than 1/10 of a

1 mile to a new pole location. From here the reroute heads in a northerly direction along
2 the edge of an existing line of trees and crosses Ferry road near the entrance to the
3 commuter rail station parking entrance. The line will then proceed to the new Charlotte
4 substation to be located on the west side of the railroad tracks near existing GMP pole
5 260 (between MP 16.9 and 17.0). The length of the reroute is approximately .5 miles.
6

7 Q19. Why is the reroute being proposed?

8 A19. The present 34.5 kV corridor is located adjacent to the Charlotte Waldorf High School.
9 In evaluating the relocation of Charlotte substation, VELCO learned that the school
10 intends to expand near its present location. VELCO's proposed reroute is intended to
11 minimize the impact of the new 115 kV line on school's expansion plans while still
12 providing a corridor for the 115 kV line.
13

14 Q20. What is the cost of the proposed reroute compared to the cost of the original
15 configuration?

16 A20. The originally proposed the line was approximately .4 miles in length. The new
17 proposed configuration is approximately .1 miles longer and will cost approximately
18 \$28,000 more than the original proposal.
19

20 **4. Shelburne Reroute**

21 Q21. Please describe the Shelburne reroute.

22 A21. Referring to VELCO Exhibit TD-Supp(1)-3, VELCO is proposing to move the proposed
23 corridor for the 115 kV line from the Davis Park neighborhood to the west to property
24 owned by the Meach Cove Trust. The new proposed corridor would leave the existing
25 corridor near GMP pole 177 and head in a northwesterly direction along the edge of the
26 McCabe Brook wetland for approximately .35 miles. At this point the corridor is
27 proposed to head northeast and rejoin the existing corridor near GMP pole 159. VELCO

1 proposes to use its best efforts to avoid placing poles in the wetlands by using structures
2 that would allow VELCO to span the wetlands. VELCO expects that the number of poles
3 in or near the wetlands to be reduced under the proposed relocation because the span
4 length for the new construction will be considerably longer than what is used on the
5 present line. The proposed reroute is approximately .5 miles in length.

6
7 Q22. Why is VELCO proposing the Shelburne reroute?

8 A22. VELCO is proposing the reroute to move the line from a corridor that is in close
9 proximity to several homes in the Davis Park neighborhood. Where possible, VELCO
10 attempts to avoid placing transmission corridors near homes to minimize the impact of
11 construction and maintenance activities and visual impacts on residents. In the case of
12 the Davis Park neighborhood, VELCO has identified a viable alternative to the present
13 corridor.

14
15 Q23. What is the cost of the proposed reroute compared to the cost of the original
16 configuration?

17 A23. The originally proposed the line was approximately .4 miles in length. The new
18 proposed configuration is less than .1 miles longer and will cost approximately \$28,000
19 more than the original proposal.

20
21 **5. 115 kV and 345 kV Structure Height Changes**

22 Q24. Is VELCO proposing to change the height of the structures on the 115 kV New Haven to
23 Queen City and the 345 kV West Rutland to New Haven lines?

24 A24. Yes. As detailed fully in Mr. Boers' testimony, VELCO is proposing to use a range of
25 structure heights when constructing the transmission lines. With the proposed changes,
26 the great majority of the structures on the 115 kV will be between 52 and 75 feet in
27 height. On the 345 kV line, the structures will be between 61 and 97 feet in height.

1 Q25. Why is VELCO proposing this change?

2 A25. VELCO is aware of the concerns about the impacts of the proposed transmission lines.
3 Having a range of pole heights available provides VELCO with flexibility to customize
4 the size of a structure used in a particular location to address a particular concern. For
5 example, one way to address concern about the visibility of the proposed lines is to lower
6 the height of the structures where possible. On the 345 kV line, it may be advantageous
7 to use shorter structures and locate the structures next to the existing 115 kV structures in
8 areas where the corridor is highly visible. In some areas it may be desirable to avoid
9 placing poles in sensitive locations (e.g., wetlands). The use of taller poles would enable
10 VELCO to increase span lengths (i.e., distance between the structures) to possibly span a
11 wetland or reduce the number of structures required. In this way VELCO can address the
12 serious aesthetic or environmental concerns identified by the Parties.
13

14 **III. Substation Changes**

15 **1. New Vergennes Substation**

16 Q26. Please describe the proposed substation.

17 A26. After evaluating several locations, VELCO is recommending a site in Vergennes as the
18 preferred location for the new 115/34.5 kV substation. Referring to VELCO Exhibit TD-
19 Supp(1)-4, the site is located to the west of Route 22A near Kayhart Crossing across from
20 a feed silo in an industrial and commercial area of Vergennes. The 115 kV line from
21 New Haven would leave the railroad and cross Route 22A to enter the substation. Exiting
22 the substation, the line will head north and will be located near the western edge of a
23 screen of trees to a point where it rejoins the railroad near MP 7.8 in Ferrisburgh. GMP's
24 34.5 kV line will exit the substation and head north and then west. The 34.5 kV line will
25 follow the border of an active agricultural field to a point where it joins up with an
26 existing distribution line. The 34.5 line will be co-located with distribution line to a point

1 where it joins Botsford Road in Ferrisburgh where the new 34.5 kV line will connect with
2 GMP's existing 34.5 kV line.
3

4 Q27. Why is VELCO recommending the Vergennes site for the new substation?

5 A27. Of the alternatives considered, the Vergennes site is the closest to the existing GMP
6 Vergennes substation. This results in the shortest possible 34.5 kV transmission line to
7 serve Vergennes. Second, as noted in Mr. Boyle's testimony, this site is located in an
8 industrial area and the substation can be effectively screened from Route 22A. The visual
9 impact of the 115 kV line would also be improved by placing the line along the western
10 edge of the substation parcel using a screen of trees to provide a backdrop for the line as
11 it runs north towards the railroad.
12

13 Q28. What is the estimated cost of the new Vergennes substation as compared to the cost of
14 Vergennes substation as originally proposed?

15 A28. The estimated cost to build the new Vergennes substation is \$3,690,000. The estimated
16 cost of the expansion at the existing Vergennes site is \$2,454,000. Thus, the cost to
17 construct the new Vergennes substation is approximately \$1,236,000 more than the
18 original proposal.
19

20 Q29. Are there other factors that may affect the difference in cost between the original
21 Vergennes filing and the new substation?

22 A29. Yes. The original Vergennes substation proposal calls for open air bus work and a
23 sizable expansion of the footprint. Given the concerns about aesthetic and land use
24 impacts at this site expressed by several intervenors, it is conceivable that the use of
25 alternative technology to reduce these impacts might have been necessary. One likely
26 technology is gas insulated switchgear that would allow for the required electrical

1 expansion while using a smaller footprint. The cost of this equipment, however, would
2 be substantially more expensive than the original estimate.
3

4 **2. Charlotte Substation Relocation**

5 Q30. Please describe the Charlotte substation relocation.

6 A30. VELCO is proposing to move the site of the Charlotte substation to the west side of the
7 railroad tracks approximately 850 feet to the north of the existing site. Please see
8 VELCO Exhibit TD-Supp (1)-5.
9

10 Q31. Why is VELCO proposing to relocate the Charlotte substation?

11 A31. Representatives from the Town of Charlotte asked VELCO if the substation could be
12 relocated to reduce the visual impact of the substation and to move it further away from
13 nearby residences. In addition, in Mr. Gilman's earlier testimony, it was noted that
14 expansion of the existing site could involve undesirable environmental impacts. VELCO
15 evaluated alternative locations and determined that the new site proposed in this
16 testimony would work satisfactorily as the new substation site. As indicated by Mr.
17 Boyle, the proposed site will reduce the visual impact of the substation. Mr. Gilman
18 notes that the proposed site avoids many of the concerns he expressed about the
19 expansion at the existing GMP site.
20

21 Q32. What is the estimated cost of the relocated Charlotte substation as compared to the cost of
22 substation expansion as originally filed?

23 A32. The estimated cost for the relocated Charlotte substation is approximately \$67,000 more
24 than the estimated cost of expanding and building the substation at the existing site
25 (original filing).
26
27

1 **3. Shelburne Substation Redesign**

2 Q33. Please describe the changes VELCO is proposing for the Shelburne substation design.

3 A33. VELCO is proposing a change to the design of the substation to avoid an expansion of the
4 substation to the west. To accomplish this, VELCO is proposing to replace the existing
5 12 kV lattice tower with metal-clad switchgear (see VELCO Exhibit TD Supp(1)-6). The
6 new 12 kV equipment requires a smaller footprint than the existing equipment. With the
7 redesign, the size of the new substation is reduced from approximately 18,000 square feet
8 to approximately 10,600 square feet.

9
10 Q34. Why is VELCO proposing these changes?

11 A34. Shelburne representatives have expressed a concern about the impact of the proposed
12 substation expansion on the access path to Ticonderoga Haul Road located immediately
13 to the west of the substation. The representatives also expressed concerns about the
14 visual impact from Harbor road of the existing substation. As noted by Mr. Boyle, the
15 new proposed design provides an opportunity for enhanced screening to reduce the visual
16 impact of the substation from the east, west and south.

17
18 Q35. What is the estimated cost of the redesigned Shelburne substation as compared to the cost
19 of substation expansion as originally filed?

20 A35. The estimated cost for the redesigned Shelburne substation is approximately \$21,000
21 more than the estimated cost of the original design.

22
23 **4. Queen City Substation**

24 Q36. Please describe the proposed changes to the Queen City substation design.

25 A36. VELCO is proposing a change to the design of the substation so that both 115 kV lines
26 will enter the substation from the east. Referring to VELCO Exhibit TD Supp(1)-7,
27 VELCO is also to proposing to reorient the control building so that the long axis of

1 building runs east to west along the southern fence of the substation. With the change in
2 design, the expansion of the substation will occur to the east and to the north of the
3 existing station.
4

5 Q37. Why has VELCO proposed the redesign of the substation?

6 Q37. In meetings with nearby residents and officials from the City of South Burlington,
7 VELCO learned of visual and noise concerns regarding the plans to expand the Queen
8 City site to the south. As originally proposed, the site would have been expanded to the
9 south in addition to the east and north. This would have resulted in the removal of trees
10 located to the south of the substation fence. VELCO was asked if there was a way to
11 change the design to avoid the removal of these trees. VELCO evaluated options to meet
12 this request and determined that the new proposed design would be acceptable from an
13 operating and reliability perspective. VELCO reviewed the proposed redesign with
14 officials from the City of South Burlington and nearby residents. Both the City officials
15 and the residents were supportive of the proposed redesign.
16

17 Q38. What is the estimated cost of the redesigned Queen City substation as compared to the
18 cost of substation expansion as originally filed?

19 A38. The estimated cost for the redesigned Queen City substation and the substation expansion
20 as originally filed is the estimated to be same at approximately \$3.4 million.
21

22 Q39. What is the total cost of the transmission elements in the supplemental filing as compared
23 to the cost of the transmission elements in the original filing?

24 A39. The cost of the transmission elements in the supplemental filing is estimated to be
25 approximately \$1.1 million more than cost of the transmission elements in the original
26 filing. Of this increase approximately \$735,000 is PTF and \$411,000 is non-PTF.
27

1 **IV. Other Issues**

2 **1. Underground Transmission**

3 Q40. What information does VELCO have on underground transmission?

4 A40. VELCO asked Burns & McDonnell to develop preliminary cost and engineering
5 information for placing several segments of the proposed 115 kV transmission lines
6 underground. This information is contained in a report prepared by Mr. Boers (see
7 VELCO Exhibit DJB-Supp(1)-47).

8
9 Q41. Why is VELCO doing this work?

10 A41. VELCO has agreed to develop this information in response to requests from
11 representatives of the towns of Charlotte and Shelburne. The information about the cost
12 of undergrounding the transmission line is an important consideration when evaluating
13 requests to place the line underground.

14
15 Q42. Does VELCO support undergrounding of any parts of the proposed 115 or 345 kV
16 transmission lines?

17 A42. No. VELCO believes that the overhead lines can be operated and maintained in a safe
18 and efficient manner. As noted in Mr. Boyle's testimony, VELCO believes that the lines
19 can be built without having an undue, adverse impact on aesthetics. As shown in the
20 table below, the cost to install the 115 kV line underground is approximately eight to ten
21 times the cost to build the line overhead. In addition, the construction impacts associated
22 with placing the line underground the could be significant.

23

24

Cost Comparison of 115 kV Underground Construction and 115 kV Overhead Construction				
Line Segment	Length (miles)	Cost 3-cable Underground design	Cost 4-cable Underground design	Cost Overhead Design
Charlotte	3.72	\$8,633,000	\$10,472,000	\$1,031,842
Shelburne South	1.90	\$4,614,000	\$5,632,000	\$527,016
Shelburne North	2.07	\$5,009,000	\$6,096,000	\$574,170

Notes:
 1. Does not include cost of directional drilling or other special construction techniques.
 2. Does not include right-of-way costs.

2. Granite Substation

Q43. Given the concerns expressed in the Public Service Department’s prefiled testimony about the Granite substation, what is the status of the Granite substation configuration?

A43. VELCO is evaluating the concerns expressed and is exploring options to address the concerns. VELCO intends to work with the Department and I believe that we can resolve most of the issues. Any open questions will be addressed in our rebuttal testimony.

Q44. Does this conclude your testimony?

A44. Yes.

EXHIBITS LIST

Thomas Dunn

Exhibit TD Supp(1)-1	Vergennes and Ferrisburgh Reroute
Exhibit TD Supp(1)-2	Charlotte Reroute
Exhibit TD Supp(1)-3	Shelburne Reroute
Exhibit TD Supp(1)-4	Orthophoto of the new VELCO Vergennes Substation Upgrade
Exhibit TD Supp(1)-5	Orthophoto of the new VELCO Charlotte Substation Upgrade
Exhibit TD Supp(1)-6	Orthophoto of the redesigned VELCO Shelburne Substation Upgrade
Exhibit TD Supp(1)-7	Orthophoto of the redesigned VELCO Queen City Substation Upgrade